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SECURITY CLASSIFICATION OF THIS PAGE

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AD-A225 481

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REPORT DOCUMENTATION PAGE

Form Approved OMB No. 0704-0188

1a. REPORT SECURITY CLASSIFICATION: Unclassified

1b. RESTRICTIVE MARKINGS

2a. SECURITY CLASSIFICATION AUTHORITY

2b. DECLASSIFICATION / DOWNGRADING SCHEDULE

3. DISTRIBUTION / AVAILABILITY OF REPORT: Distribution of this report is unlimited

4. PERFORMING ORGANIZATION REPORT NUMBER(S)

5. MONITORING ORGANIZATION REPORT NUMBER(S): AFOSR-TR-89-0820

6a. NAME OF PERFORMING ORGANIZATION: University of Georgia

6b. OFFICE SYMBOL (If applicable)

7a. NAME OF MONITORING ORGANIZATION: AFOSR/NC

6c. ADDRESS (City, State, and ZIP Code): Department of Chemistry, Athens, Georgia 30602

7b. ADDRESS (City, State, and ZIP Code): Building 410, Bolling AFB, DC 20332-6448

8a. NAME OF FUNDING / SPONSORING ORGANIZATION: Air Force Office of Scientific Research

8b. OFFICE SYMBOL (If applicable): NC

9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER: AFOSR-88-0255

8c. ADDRESS (City, State, and ZIP Code): Bolling Air Force Base, D. C. 20332

BKI 41C

10. SOURCE OF FUNDING NUMBERS

PROGRAM ELEMENT NO.	PROJECT NO.	TASK NO	WORK UNIT ACCESSION NO.
61102F	2303	B2	

11. TITLE (Include Security Classification): Symposium on Metals in Biochemistry and Materials Science

12. PERSONAL AUTHOR(S): R. B. King

13a. TYPE OF REPORT	13b. TIME COVERED	14. DATE OF REPORT (Year, Month, Day)	15. PAGE COUNT
Final Conference Report	FROM 1/9/88 TO 31/8/89	June, 1989	9

16. SUPPLEMENTARY NOTATION

17. COSATI CODES		
FIELD	GROUP	SUB-GROUP

18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
Conference, Biochemistry, Metalloenzymes, Symposium, Solid State, Electron Transfer, Metals, Superconductivity

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

The 1989 Biennial Inorganic Symposium with the theme "Inorganic Compounds with Unusual Properties. III. Electron Transfer in Biology and the Solid State" was held at the University of Georgia in Athens, Georgia, during the period March 1-4, 1989. The symposium stimulated interactions between scientists studying mechanisms of electron transfer between metal centers in solid state materials and those studying the same process in metalloproteins. The program consisted of 17 invited talks, 10 contributed oral presentations, and 21 poster presentations. A book containing papers for 23 of the 27 oral presentations is being published by the American Chemical Society as an Advances in Chemistry Series volume. Lists of the symposium participants and titles of both the oral presentations and poster presentations are appended to this report.

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Distribution Unlimited

20. DISTRIBUTION / AVAILABILITY OF ABSTRACT
☒ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT. ☐ DTIC USERS

21. ABSTRACT SECURITY CLASSIFICATION: Unclassified

22a. NAME OF RESPONSIBLE INDIVIDUAL: Dr. Anthony J. Matuszko

22b. TELEPHONE (Include Area Code): 202-767-4960

22c. OFFICE SYMBOL: NC

DD Form 1473, JUN 86 — Previous editions are obsolete.

SECURITY CLASSIFICATION OF THIS PAGE
Unclassified

90 08 20 102

AFOSR-TR 89-0520

FINAL CONFERENCE REPORT

to the

Air Force Office of Scientific Research

U. S. Air Force

Bolling Air Force Base, D. C. 20332

on

SYMPOSIUM ON METALS IN BIOCHEMISTRY AND MATERIALS SCIENCE

Period Covered:

September 1, 1988 to August 31, 1989

Grant Covered

AFOSR-88-0255

by

Dr. R. B. King

Regents' Professor of Chemistry

University of Georgia

Athens

Georgia 30602

Distribution of this report is unlimited

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The 1989 Biennial Inorganic Symposium with the theme "Inorganic Compounds with Unusual Properties. III. Electron Transfer in Biology and the Solid State" was held at the University of Georgia in Athens, Georgia, during the period March 1-4, 1989. The planning committee consisted of Prof. R.B. King (Chairman), Prof. M. K. Johnson, Prof. D. M. Kurtz, Prof. C. Kutal, Prof. M. L. Norton, and Prof. R. A. Scott, all University of Georgia faculty members. This symposium was part of the regular biennial symposium series of the Division of Inorganic Chemistry of the American Chemical Society. In addition to the Air Force Office of Scientific Research, funding for this symposium was received from the Petroleum Research Fund of the American Chemical Society, E. I. du Pont de Nemours and Company, and the University of Georgia Research Foundation.

This symposium was very effective in its stated purpose of stimulating interactions between scientists who are studying mechanisms of electron transfer between metal centers in solid state materials and those who are studying the same process in metalloproteins. In addition to the 17 invited speakers (appendix 1) there were 10 additional participants chosen to give shorter oral presentations (appendix 2), and 41 additional participants (appendix 3) other than University of Georgia students, post-doctoral fellows, and faculty. The scientific program (appendix 4) consisted of 40-minute talks by the 17 invited speakers, shorter 20-minute contributed papers from the 10 additional persons, and 21 poster presentations (appendix 5). Manuscripts have been received for 23 of the 27 oral presentations for an Advances in Chemistry series volume covering the Symposium and to be published, probably next year, by the American Chemical Society.

The grant from the Air Force Office of Scientific Research was most useful in covering partial travel support for the American invited speakers from academic institutions. The funding from the Petroleum Research Fund covered the expenses of the two invited foreign speakers and the funding from du Pont covered some of the expenses of the social programs.

APPENDIX 1

INVITED SPEAKERS AT THE 1989 BIENNIAL INORGANIC SYMPOSIUM

PROGRAM

BARTLETT, NEIL	DEPT. OF CHEMISTRY	BERKELEY	CA	94720	UNIV. OF CALIFORNIA
BURDETT, JEREMY	CHEMISTRY	CHICAGO	IL	60637	UNIV. OF CHICAGO
CLOSS, GERHARD L.	CHEMISTRY	CHICAGO	IL	60637	THE UNIV. OF CHICAGO
CORFETT, JOHN D.	CHEMISTRY	AMES	IA	50011	IOWA STATE UNIV.
GOODENOUGH, JOHN B.	ELECTRICAL ENGINEERI	AUSTIN	TX	78712	UNIV. OF TEXAS
HOFFMAN, BRIAN M.	CHEMISTRY	EVANSTON	IL	60208	NORTHWESTERN UNIVERSITY
HUSH, NOEL S.	THEORETICAL CHEMISTR	AUSTRALIA		2006	UNIVERSITY OF SIDNEY
IBERS, JAMES A.	CHEMISTRY	EVANSTON	IL	60208	NORTHWESTERN UNIV.
ISIED, STEPHAN S.	CHEMISTRY	PISCATAWAY	NJ	08855	RUTGERS UNIV.
MARKS, TOBIN J.	DEPT. OF CHEMISTRY	EVANSTON	IL	60201	NORTHWESTERN UNIV.
MCELHOON, GEORGE	CHEMISTRY	ROCHESTER	NY	14627	UNIV. OF ROCHESTER
MILLER, JOEL S.	ESPERIMENTAL STATION	WILMINGTON	DE	19898	CENTRAL RES. & DEV. DEPT.
MILLER, JOHN	CHEMISTRY	ARGONNE	IL	60439	ARGONNE NATIONAL LAB.
PHILLIPS, J.C.	BELL LABS	MURRAY HILL	NJ	07974	AT&T
SUTIN, NORMAN	CHEMISTRY	UPTON	NY	11973	BROOKHAVEN NATIONAL LAB
WHANGBO, M.H.	CHEMISTRY	RALEIGH	NC	27695	N.C. STATE UNIV.
WILLIAMS, R.J.P.	CHEMISTRY	OXFORD	OX	3QR	OXFORD UNIVERSITY

Total: 17

APPENDIX 2

PERSONS GIVING ORAL CONTRIBUTED PAPERS AT THE 1989 BIENNIAL INORGANIC SYMPOSIUM

BARROWS, JULIE N.	DIVISION OF COLORS &	WASHINGTON	DC	20204	U.S. FOOD & DRUG ADMIN.
BEER, THOMAS	CHEMISTRY	ALBUQUERQUE	NM	87131	UNIV. OF NEW MEXICO
DIXON, BARNEY WHITE	CHEMISTRY	ATLANTA	GA	30303	GA. STATE UNIVERSITY
DURHAM, BILL	CHEMISTRY & BIOCHEMI	FAYETTEVILLE	AR	72701	UNIV. OF ARKANSAS
HOPKINS, JOHN B.	CHEMISTRY	BATON ROUGE	LA	70803	LOUISIANA STATE UNIV.
LAFFIN, A.G.	CHEMISTRY	NOTRE DAME	IN	46556	UNIV. OF NOTRE DAME
ONDRECHEN, MARY JO	CHEMISTRY	BOSTON	MA	02115	NORTHEASTERN UNIV.
SCHANZE, KIRK	CHEMISTRY	GAINESVILLE	FL	32611	UNIV. OF FLORIDA
SCHMEHL, RUSSELL H.	CHEMISTRY	NEW ORLEANS	LA	70118	TULANE UNIV.
TAYLOR, DANIEL V.	CHEMISTRY	CORAL GABLES	FL	33124	UNIV. OF MIAMI

Total: 10

APPENDIX 3

PARTICIPANTS IN THE 1989 BIENNIAL INORGANIC SYMPOSIUM NOT GIVING ORAL PRESENTATIONS

(Excludes University of Georgia Faculty and Students)

NAME	STREET	CITY	STATE	ZIP	ORGANIZATION
[illegible]					
ABDEL-FATTA, ISAM	CHEMISTRY DEPT.	COLUMBIA	SC	29208	UNIV. OF S.C.
ARCHER, RONALD	CHEMISTRY DEPT.	AMHERST	MA	01002	UNIV. OF MASSACHUSETTS
ARMITAGE, FRANCES	CHEMISTRY	GAINESVILLE	FL	32611	UNIV. OF FLORIDA
BOTTOMLEY, LARRY	SCHOOL OF CHEMISTRY	ATLANTA	GA	30332	GEORGIA TECH
BRAITERMAN, PAUL S.	CHEMISTRY	DENTON	TX	76203	UNIV. OF N. TEXAS
BREWER, KAREN J.	CHEMISTRY	PULLMAN	WA	99164	WASHINGTON STATE UNIV.
CARUNA, LEONARD A.	CHEMISTRY	GAINESVILLE	FL	32611	UNIVERSITY OF FLORIDA
COLLIOS, BRIGITTE	SGPC-CRCD	JOUY EN JOSAS	FR		L'AIR LIQUIDE
COKER, WALLY	CHEMISTRY & BIOCHEMI	FAYETTEVILLE	AR	72701	UNIV. OF ARKANSAS
DAWSON, JOHN H.	CHEMISTRY	COLUMBIA	SC	29208	UNIV. OF SOUTH CAROLINA
EARLEY, JOSEPH	CHEMISTRY	WASHINGTON	DC	20057	GEORGETOWN UNIVERSITY
LEMAN, JAMES	CHEMISTRY	DEKALB	IL	60115	NORTHERN ILLINOIS UNIV.
FLUMER, WALTER	CHEMISTRY	CLEMSON	SC	29634	CLEMSON UNIVERSITY
GOODMAN, FRAN	CHEMISTRY	GAINESVILLE	FL	32611	UNIV. OF FLORIDA
HARTHUP, MELODY	CHEMISTRY	GAINESVILLE	FL	32611	UNIV. OF FLORIDA
HASSETT, KAREN	CHEMISTRY	RALEIGH	NC	27607	MEREDITH COLLEGE
HEIN, W.E.	CHEMISTRY	LANCASTER	PA	17603	FRANKLIN & MARSHALL COLL.
HOFFMAN, ALISON B.	CHEMISTRY	CAMBRIDGE	MA	02139	MIT
HOFFMAN, JAMES J.	CHEMISTRY	CAMBRIDGE	MA	02143	MIT
HONG, [illegible]LE	CHEMISTRY	ATLANTA	GA	30303	GA. STATE UNIVERSITY
KAUTZIOS, M.G.	CHEMISTRY	EAST LANSING	MI	48824	MICHIGAN STATE UNIV.
LIN, MIN SOOK	CHEMISTRY	ATLANTA	GA	30303	GA. STATE UNIVERSITY
MOLIS, JOSEPH W.	CHEMISTRY	CLEMSON	SC	29634	CLEMSON UNIVERSITY
MOSLEAK, ALBERT D.	CHEMISTRY	LOWELL	MA	01854	UNIV. OF LOWELL
PU, REITAH	CHEMISTRY	WASHINGTON	DC	20057	GEORGETOWN UNIVERSITY
PUDI, SURESAS	INST. FUR ANORGANISC	BERN	CH		UNIVERSITAT BERN
RAUENSTAHL, MIKE	HAUPTLABOR G 830	GERMANY			HOECHST AG.
RAYONEY, MICHAEL	CHEMISTRY	AMHERST	MA	01003	UNIV. OF MASSACHUSETTS
RUSSELL, MARK E.	CHEMISTRY DEPT.	CHARLESTON	IL	61920	EASTERN ILLINOIS UNIV.
RUSSELL, BRENT		CLEMSON	SC		
RUSSELMAN, RONALD L.	CHEMISTRY	LANCASTER	PA	17604	FRANKLIN & MARSHALL COLL.
SCHILLE, SHARON M.	CHEMISTRY	NORTHAMPTON	MA	01063	SMITH COLLEGE
PERKINS, THOMAS A.	CHEMISTRY	GAINESVILLE	FL	32611	UNIVERSITY OF FLORIDA
POPE, MICHAEL T.	CHEMISTRY	WASHINGTON	DC	20057	GEORGETOWN UNIVERSITY
RICHARDSON, DAVID	CHEMISTRY	GAINESVILLE	FL	32611	UNIV. OF FLORIDA
RYU, CHONG KUL	CHEMISTRY	NEW ORLEANS	LA	70125	TULANE UNIVERSITY
SHAW, JOHN R.	CHEMISTRY	NEW ORLEANS	LA	70118	TULANE UNIV.
SIDHA, JABIL R.	NATURAL SCIENCES	ROANOKE	VA	24018	VA. WESTERN COMM. COLLEGE
WEST, DOUGLAS X.	CHEMISTRY	NORMAL	IL	61761	ILL. STATE UNIV.
WITT, JERRY	CHEMISTRY	WINONA	MN	55987	WINONA STATE UNIVERSITY
WOLLHER, SCOTT	DEPT. OF CHEMISTRY	W. LAFAYETTE	IN	47907	PURDUE UNIV.

Total: 41

APPENDIX 4

PROGRAM OF THE 1989 BIENNIAL INORGANIC SYMPOSIUM

THURSDAY, MARCH 2, 1989

7:30 AM	Registration
8:30 AM	Opening Remarks
8:45 AM	R. J. P. Williams An Overview of Biological Electron Transfer
9:25 AM	J. R. Reimers and N. S. Hush Formalism for Electron Transfer and Energy Transfer in Bridged Systems
10:05 AM	Coffee Break
10:30 AM	N. Sutin Some Theoretical Aspects of Electron Transfer in Biological Systems
11:10 AM	S. S. Isied Directional Electron Transfer in Ruthenium Modified Cytochrome c Complexes
11:50 AM	K. S. Schanze and L. A. Cabana Photoinduced Intramolecular Electron Transfer in Peptide Bridged Molecules
12:10 PM	Lunch: Georgia Center for Continuing Education
1:30 PM	T. J. Marks Metal-Organic Chemical Vapor Deposition Routes to High-T_c Superconductors
2:10 PM	J. S. Miller and A. J. Epstein Organometallic Magnets
2:50 PM	Coffee Break
3:20 PM	F. Rogel, J. Zhang, M. W. Payne, and J. D. Corbett Centered Cluster Halides from Group Three and Group Four Transition Metals. A Versatile Solid State and Solution Chemistry
4:00 PM	T. Bein and P. Enzel Stabilization of Conducting Heteroaromatic Polymers in Large-Pore Zeolite Channels
4:20 PM	J. N. Barrows and M. T. Pope Intramolecular Electron Transfer in a Molybdophosphate Heteropoly Blue
4:40 PM	D. W. Dixon, X. Hong, and S. E. Woehler Electrostatic and Steric Control of Electron Self-Exchange in Cytochromes c, c_{551}, and b_5
5:00 PM	Social Hour: Executive Suite, Georgia Center for Continuing Education
7:00 PM	Buses leave from Georgia Center for Continuing Education for Barbecue at Charlie Williams' Pinecrest Lodge

FRIDAY, MARCH 3, 1989

8:30 AM B. M. Hoffman
Long Range Electron Transfer within Protein Complexes

9:10 AM G. McLendon
Long Distance Electron Transfer: Connections between Biology and the Solid State

9:50 AM Coffee Break

10:20 AM G. L. Closs
Novel Models for Electron Transfer

11:00 AM J. Miller
Energy, Solvent Polarity, and Temperature Dependence of Intramolecular Electron Transfer Rates

11:40 AM R. H. Schmehl and C. M. Elliott
Intramolecular Photoinduced Electron Transfer in Covalently Linked Complexes of the Type $[(bpy)_2Ru(dmb(CH_2)_n\text{-diquat})]^{4+}$

12:00 noon Lunch: Georgia Center for Continuing Education

1:30 PM N. Bartlett, F. Okino, T. Mallouk, R. Hagiwara, M. Lerner, G. Rosenthal, and K. Kourtakis
The Role of Lattice Energetics and the Electron Affinity of the Oxidizing-Reagent Combination in the Oxidative Intercalation of Graphite

2:10 PM J. B. Goodenough
Single-Valent versus Mixed-Valent Oxides

2:50 PM Coffee Break

3:20 PM J. A. Ibers
Ternary Chalcogenides in the Solid State: Syntheses, Structures, and Conductivities

4:00 PM N. A. Lewis and D. V. Taveras
High Pressure Studies of Long Range Electron Transfer in Solution

4:20 PM B. Durham, L. P. Pan, J. Hall, and F. Millett
Electron-Transfer Kinetics of Singly Labeled Ruthenium (II) Polypyridine Cytochrome c Derivatives

4:40 PM M. J. Ondrechen
Bridged Mixed-Valence Systems: How Polarizable Bridging Ligands Can Lead to Interesting Spectroscopic and Conductive Properties

5:00 PM Social Hour: Executive Suite, Georgia Center for Continuing Education

8:00 PM Poster Session and Mixer

SATURDAY, MARCH 4, 1989

8:30 AM J. K. Burdett and G. V. Kulkarni
Electronic-Geometric Relationships in Copper Oxide Based Superconductors

9:10 AM M.-H. Whangbo, M. Evain, and E. Canadell
Electronic Instability in Low-Dimensional Solids

9:50 AM Coffee Break

10:20 AM J. C. Phillips
Chemistry and Physics of High-T_c Superconductivity

11:00 AM J. B. Hopkins
The Role of Free Energy in Interligand Electron Transfer

11:20 AM R. A. Marusak, T. P. Shields, and A. G. Lappin
Chiral Recognition by Metal Ion Complexes in Electron Transfer Reactions

11:40 AM Closing Remarks

APPENDIX 5

POSTER PRESENTATIONS AT THE 1989 BIENNIAL INORGANIC SYMPOSIUM

P1. K. J. Brewer, L. O. Spreer, J. W. Otvos, and M. Calvin
Synthesis, Structure, and Characterization of a Mixed-Valence Mn(III), Mn(IV) Di-μ-Oxo Complex with a Macrocyclic Tetraaza Ligand: Modeling the Oxygen Evolving Complex in Photosynthetic Plants

P2. M. Emad, C. Walton, F. Armitage, M. Hartnup, P. Klein, and D. E. Richardson
Metallohaptens for Preparation of Monoclonal Antibodies as Metalloprotein Models

P3. X. Hong and D. W. Dixon
NMR Study of the Alkaline Isomerization of Ferricytochrome *c*

P4. A. W. Cordes, J. Graham, and A. Privett
Synthesis and Structure of Cystine Derivative Molecules and Their Use in Studies of Heavy Metal Bonding to the Disulfide Linkage

P5. T. A. Perkins, K. S. Schanze, T. L. Netzel, and D. B. Pourreau
Ligand-to-Ligand Charge Transfer Excited States in Re(I) Chromophore-Quencher Complexes

P6. M. S. Kim, S. E. Woehler, D. W. Dixon, and P. Hambright
The Role of Dipole Moments in Controlling Electron Transfer

P7. J. E. Erman, F. E. Summers, and L. B. Vitello
Electron Transfer in the Catalytic Mechanism of Cytochrome *c* Peroxidase

P8. K. Lu and J. E. Earley
Electron Transfer Across Moderate Distances in Ru(III)-Ti(III) Systems That Involve Organic Ligands with Relatively Low-energy Empty Pi Orbitals

P9. R. L. Musselman, B. M. Hoffman, M. D. Heagy, D. E. Rende, and W. B. Heuer
Single Crystal Polarized Specular Reflectance Spectra of the Metallophthalocyanines Co(pc)I, Ni(pc)I, Cu(pc)I, and H_2(pc)I: New Charge Transfer Transitions

P10. W. A. Flomer and J. W. Kolis
Transition Metal Complexes of Polytelluride Ligands

P11. M. G. Kanatzidis and S. Huang
Unusual Redox Transformations in the Au/Se System. Isolation and Characterization of $[Au_2Se_2(Se_4)_2]^{2-}$ and $[Se_{11}]^{2-}$

P12. H. Brunner, H. Diab, P. Hendry, and A. Ludi
Steric Crowding in Coordination Compounds: Co and Ru Complexes with 2,3-Diamino-2,3-dimethylbutane (tmen)

P13. M. J. Maroney, R. O. Day, T. Psyris, and J. P. Whitehead
A Structural Model for the Binding of Iron by Anthracycline Drugs

P14. M. S. Kim and D. W. Dixon
Derivatives of Protohemin at the Propionic Acid Side Chains

P15. J. Bongers, C. Walton, J. Bell, and D. Richardson
Micromolar Protein Concentrations and Metalloprotein Stoichiometries Obtained by Inductively Coupled Plasma Atomic Emission Spectrometric Determination of Sulfur

P16. P. S. Braterman and J.-I. Song
Frontier and Near-frontier Orbitals in Bipyridyl Complexes; Redox Orbital Assignment by Spectroelectrochemistry

P17. D. W. Conrad and R. A. Scott
Long-Range Electron Transfer in [Co(diAMsar)]-Modified Cytochrome *c* Derivatives

P18. R. D. Archer, N. Getoff, G. Grabner, V. J. Tramontano, and P. V. West
Electron vs. Energy Transfer in Linear Cobalt(III) Coordination Polymers

P19. D. W. Dixon, X. Hong, and S. E. Woehler
Factors Controlling Electron Self-Exchange in Cytochromes *c* and b_5

P20. M. L. Norton
Structural, Magnetic, and Electronic Constraints in (Super)conductivity

P21. S. A. Kazmi and Y. Ahmed
Kinetics of Reduction of N- and C-terminal Transferrin